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AUG. 14, 1950

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# Aviation Week

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## News Picture Highlights . . .



BLACKBURN ANTISUB PLANES PASS TESTS

Two main prototypes built by Blackburn and General Aircraft for anti-submarine warfare in a formation permitting comparison. The plane in the foreground is designated the Y.B.1 and is powered by an Armstrong Siddeley Double Mantis turbo-prop and

has counter-rotating propellers. Note exhaust smoke escape from radial thrust. In the background flies a piston engine (Y.A.5) powered by a Rolls-Royce Griffon piston engine. Y.A.5 also has jet exhaust installation but it has been blinded off.



MEET THE FLEET

Embodying the characteristics of the T-104, the Lockheed F-104 is the proposed military adaptation of a military jet, the T-104, Inc., of Longwood, Washington, maintains the combination is providing the military with an air transportable aircraft vehicle.



TURBOJET ENGINE MOUNT

Lockheed Allison T-104 (T-104) turbojet is now installed in the General Electric T-104 being built for the Air Force division of General Motors. The engine incorporates a built-in exhaust as a combustion aid.



NAVY ACCEPTS MERCATOR

A Marine F-4 Phantom II fighter jet, with a Navy crew, is shown on display in Squadron VP-21. The F-4 is powered by two P&W J-44s and two Allison J-44s, a turbo-prop, and carries extensive radar for search and bombing.



NEW CORSAIR NIGHT FIGHTER

Vought's F-4U has added a midline to its standard wing and a new letter to its designation—N for night fighter. The craft is armed with two 20 mm cannons. Several Corsair models are being seen at the Keesler Brothers.





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### AVIATION CALENDAR

Aug. 5-18—Second two-week session on high temperature research, Massachusetts Institute of Technology, Cambridge, Mass.  
Aug. 7-20—Port United States International Trade Fair, Chicago  
Aug. 14-16—Midwest West Coast meeting of the Society of Automotive Engineers, Hotel Elcom, Los Angeles  
Aug. 15—Tennessee no progress conference, Knoxville  
Aug. 20—Columbia Air Freight Clinic, sponsored by Civil Aeronautics Committee and Civilian Chapter of Commerce Aviation Association, Oakland  
Aug. 25-27—Fourth Annual Air Force Arm national convention, Hotel Rector, Boston  
Sept. 5-10—Elements flying display and exhibition, Society of British Aeronautical Engineers, Farnborough airfield, England  
Sept. 7—T-1000 & Whelan distribution operations and maintenance meeting, Pacific Aeronautics Corp., London, N. Y.  
Sept. 9-10—Third annual convention of the California Wing of the Air Force Association, Associated Springs Hotel and Spa near San Bernardino, Calif.  
Sept. 19-14—Instrument Society of America instrument conference and technical exhibit, the Columbia, Houston, Tex.  
Sept. 15-14—Conference on ground facilities for air transportation, Massachusetts Institute of Technology, Cambridge, Mass.  
Sept. 18-22—19th national instrument symposium and exhibit, Missouri Athletic Club, St. Louis, Mo.  
Sept. 19-22—First meeting on navigation and navigation, sponsored by the Institute of Navigation, the Radio Technical Committee for Aeronautics and the Radio Technical Commission for Aeronautics, Hotel Statler, N. Y. C.  
Sept. 23-27—19th national electronic symposium, Elgin Hotel, North Chicago  
Sept. 24-30—Aeronautical meeting and mail engineering display, Society of Automotive Engineers, Hotel Elcom, Los Angeles, Calif.  
Sept. 28-30—14th annual convention of the International Navigation Council, San Diego, Calif.  
Oct. 12-15—19th conference on aircraft engineering and operations, Max Westerman Field, North Carolina, University of Oakland, Newark, Ohio  
Oct. 16-18—19th annual general meeting of the International Air Transport Association, Hotel, San Francisco  
Oct. 24-25—Third annual Midwest flight engineering conference, sponsored by Westinghouse Electric Corp., Hotel Statler, Buffalo, N. Y.  
Oct. 25-26—Flight Safety Foundation annual safety seminar, Dallas, Texas  
Nov. 28-Dec. 1—Eight annual meeting of Aviation Electronics and Manufacturers Association—Ambassador Hotel, Los Angeles

### PICTURE CREDITS

15—McGraw-Hill World News 41—McGraw-Hill World News

## NEWS DIGEST

### DOMESTIC

Stephen T. Kase, Deputy Secretary of Defense, has agreed to step to his post earlier than month because of the Korean situation. He was asked to leave government service the first of this month. Top Pentagon sources indicated that his replacement would have been Frank Pace, present Army Secretary.

Aircraft shipments for May were 3,785,950 in constant weight, was 3,785,950 in, according to the Bureau of the Census and CNA, with 86 percent going to military customers. Exported cargo to 4,498,890 hp, with 56 percent going to the military. May shipments of cargo planes amounted to 377 valued at \$7.8 million, compared with April's 319 planes valued at \$6.4 million. Airframe employment was up slightly to 165,275, and engine plant employment also showed a slight increase.

Personal and executive plane shipments (1-10 plane category) by aircraft companies came to 514 during June, with 100 being one- and two-place only. Non military plane sales of all colors at \$1,987,000. Previous month's shipments by aircraft companies totaled 599 worth \$1,703,060. Exports for June of personal and executive planes of 508 and value came to 29 planes valued at \$221,850.

Martin's 20-2A, being built for use and loaned to Texas World Airlines, has been certified by CAA for a gross takeoff weight of 13,000 lb. The aircraft powered gross for the plane had been 11,000 lb.

Eastern Air Lines has signed a \$900,000 contract with Texas Engineering & Manufacturing Co. for major overhaul and modification of 30 EAL passenger and cargo DC-4s. Work will be completed by December.

Strike vote of Eastern Air Lines ground maintenance employees approved strike by 91 percent but International Association of Mechanics, to which the workers belong, said Aug. 28 would be the earliest a walkout could occur. Union and airline have been unable to agree on wage terms. Negotiations for the 2400 employees began last October.

A large contract for communication and navigation equipment has been awarded Collins Radio Co., Cedar Rapids, Iowa, by TWA. Contract cov-

ers equipment for TWA's Martin 4-0-4s, and for completing antenna installations in the airline's present Convairliners fleet.

### FINANCIAL

Curtis-Wright Corp. reports profit of \$1,516,697 for three months ending June 30 on sales of \$12,776,797. Included in this profit was a Wright Aerochemical net for the period of \$965,130 on sales of \$18,965,688. For the first six months of this year, Curt's profit amounted to \$3,557,367 on sales of \$61,496,744, with Wright accounting for \$2,037,590 in profit and \$17,460,496 in sales.

Wiggins Air Lines reports net profit of \$128,110 for the first half-year on total operating revenues of \$6,628,720. Compared to a year ago, revenues were down 14 percent and revenue passenger miles down 58 percent.

Solar Aircraft Co. reports for the fiscal year ended April 30, 1950, profit of \$3,394,066 on sales of \$21,458,575. For the preceding year, profit was \$1,103,587 on sales of \$17,576,199.

Consolidated Value Aircraft Corp. reports profit for the six months ending May 31 of \$4,465,527 on sales of \$146,000,000.

Citadel Airlines turned in a profit for the six months ending June 30 of \$382,250 on total operating revenues of \$13,414,245. Operating revenues for June reached an all-time high at \$2,626,026, and revenue passenger miles of 41,182,212 for the month also set a new record.

### INTERNATIONAL

BOAC has worked out a special deal with Sperry Gyroscope Co., Ltd., England, to obtain an expanded number of Sperry Zane Readers for greater satisfaction in the de Havilland Comet and other aircraft.

Aero Astion design aircraft is slated to be one of the 60 different types of planes scheduled for display at the Society of British Aircraft Constructors' Birmingham Show Sept. 6-8. The Astion is a derivative of the Nepea powered T-60 prototype, and has been ordered by the Ministry of Supply for "research into the characteristics of high-altitude jet flight."

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## WHO'S WHERE

### In the Front Office

James H. Ford has been named president of Everett Precision Co. and Henry R. Mahony has been appointed chairman of the board. Ford dates his personal experience back to 1922 when he was a chief parts officer at Pomona and was assigned to the Air Corps production school for a course in manufacturing. In 1923, he joined the Irving Air Chute Co. and later became associated with Pioneer Sales, he has been vice president since 1959. Mahony had been president and manager of Pioneer since 1959 and also a PIONEER Inc. president and treasurer of Chicago, Illinois.

Pitts-Bushnell has been made vice president of production at Culbert Industries, Inc., Kent, Ohio, maker of electronic aiming gear for the aircraft and other industries. He was formerly associated with Packard-Little Inc. as vice president of General Motors Corp.

### Changes

Dr. Nicholas J. Hoff, retired aeronautical engineer, will become head of the department of aeronautical engineering and applied mechanics at Polytechnic Institute, of Brooklyn on Sept. 1.

J. R. Robinson has been appointed deputy director of aircraft and airports of the Department of Transport Officers replacing Maj. Robert Doolittle, recently promoted to controller of civil aviation.

Martha S. Sellen has been named assistant to the executive vice president of the National Jet Council.

Among the Manufacturers Group, Inc. has been put in charge of foreign sales and publicity, Inc. Hiram Amick Co. Samuel McGonigal has joined Stratus Corp. as personnel director. Herman Riva has been named chief of the technical department, Chase & Nelson Co. He replaces J. M. Bushnell, resigned. F. K. Stoddard, branch Amtek director of sales has resigned to become proprietor of the Space Tech. Co. at Laguna, Calif. Laddie Gervais and Mike Mangano continue as distributor and foreign office manager respectively. Harold B. Nelson, branch manager sales at Air Force Trains, has joined Beech at chief of the aircraft sales and publicity section. E. D. Wilson, sales engineer for Chem. Rort Co. in Upper New York State, has moved to Syracuse, N. Y., in the charge of the company's sales and service representatives in that locality.

With the Airlines-Andrew S. McUniversity has been appointed treasurer of United Air Lines, succeeding N. B. Maher, resigned.

For American World Airways' Latin American division has named Santos Gomez manager of the Miami section. Gene Richard S. Mitchell replaces Co. as a manager of general operations and Arthur S. Rice succeeds Mitchell as superintendent of station.

## INDUSTRY OBSERVER

German sources say Rhein in flight testing a new supersonic rocket-propelled fighter, codenamed design of Alexander Yakovlev, a captured YAK 21, the plane is a modification of the German ME-109, a rocket-propelled, turbojet intercepter made by Junkers at Dessau now in the Russian zone. Basic change incorporated in the YAK 21 is addition of a horizontal tailplane, presumably to improve uncontrollable nose-down pitching at high subsonic Mach numbers.

Avonair transport competition evolution, from faster delayed, between Northrop C-125, Chase XC-123 and a superpropeller Fairchild C-119, got under way at Eglin AFB, Fla., this week, with a quantity production contract in the offing, says the source. Chase XC-123, two-engine light aircraft transport originally developed as a four-place, will be evaluated against its own design performance. Evaluation of planes involved will last through September 18.

Section factor relating development of helicopters powered by jet fuels as a safety factor involved in an investigation directed at event of power failure. NACA studies indicate that rate of descent under such conditions for a "representative target design" would increase to about 1750 fpm from 1500 fpm, but under more without the additional drag of the tip jet units. Both calculations assume a 600-hp tip speed. Highest safety, however, show up better than target with in a state of powerless thrust to potential drag. Reduction of the powerless drag of tip jet units is recommended, presumably by redesign.

CF 106, Canadian all-weather long-range jet fighter manufactured by A. V. Roe, Ltd., has been designated "Canard" by the Royal Canadian Air Force. Second fighter built by Avro was scheduled to begin flight test only this month. First lot of ten ordered by RCAR probably will be equipped with two Rolls-Royce 7500 lb thrust Avons. Later versions will be powered by the Canadian developed and-built Avon Grande now in service test.

New air bases for USAF strategic bombers are being prepared inland from England's east coast. Under construction near Oxfordshire, strips and facilities are large enough for Convair B-56 bombers. Strength of USAF force in England is 14,000 men-plus, crews and personnel for three bomber groups and one jet fighter group.

Negotiations have been completed by de Havilland Aircraft Co., Ltd., for the establishment of a Vampyre jet fighter assembly plant at Giza, Egypt. Egyptian government is also reported to be scheduled for establishment and equipping of an aircraft factory under the program of changing military aircraft parts. Plans are to manufacture fighter and fighter jet aircraft for the Royal Egyptian Air Force.

Planned Helicopter Corp., Morton, Pa., delivered its first HRP-2 to Marine Corps HMM-1 Helicopter Squadron, Quantico, Va., following acceptance tests at Naval Air Test Center, Md. The "Tiger" Ensign will be used by the Marines to develop further helicopter assault tactics.

Boring Aircraft Co. has abandoned proposed plans to build the Swedish transport of MAH at Boeing's Seattle plant. Company officials feel that the Swedish is not modern enough in design and that its sales potential is a reach, would be too limited to permit Boeing to build overseas plants to make the price competitive.

Eastern Air Lines has almost completed converting its fleet of 14 Model 649 Constellations to T-44s. The modification program which will be finished in a month, is being performed at the company's main overhaul base at Miami. EAL is now selling two birds with one stone. It is not only increasing the payload and range of its Constels, but is also providing work for its Miami staff (and its working hours) during the normally slack summer season. Cost and maintenance of the conversion were not revealed.



## How Industry Gears for Increased Output

**Weakest spot: lack of plans by military to use small firms.**

By Alexander McFarley

Into the past figure parade of expanded military aircraft procurement, Air Force and Navy planners and the big engine and engine component last week were fitting together a few pieces of the complicated supply and sub-contractor background, as necessary for a complete picture and engine picture.

Two main problems complicated their job.

- **Threats of little companies**, many of whom probably will fit into the picture eventually as sub-subcontractors, were clanking in, as it were, at the frontiers and Wright Field, and at prime contractors, to get into the act. You couldn't blame them. They were trying to move, and eager to get military contracts in case materials shortages curtailed their civilian production. But they interfered with the orderly distribution of major subcontracts and equipment contracts.

- **Lack of detailed industrial planning** in the small business echelon of sensitive supply and equipment. This was nobody's fault except the economy situation in Washington who cut back industrial planning. But now it was beginning to be felt.

- **Starting from scratch**—At the Committee's Redman office at Wright Field, more than 500 small business representatives rolled last week—215 in one day. Many of the companies had never had government contracts before. They had to start from scratch to find out whether they could make something the Air Force wanted.

The situation naturally as far as available number of components, accessories and equipment was concerned was far different than it was 14 months back, industry sources said. Then aircraft and engine companies made most of the back work and the industry looking for small parts people who would take on the immense quantities of parts production for which the industry could not contract.

Some time present to that, Malcolm P. Ferguson, who is president of the Air Force Aviation Corp., told the Redman Air Policy Committee. "It is of course impossible under present relations to ac-

### Labor Supply In Aircraft Manufacturing Centers

This listing shows the percentage of the total labor force which is employed in important aircraft manufacturing centers. Source: a U. S. Department of Labor, Bureau of Employment Service.

|                  | May 1959 | May 1949 |
|------------------|----------|----------|
|                  | Percent  | Percent  |
| Hartford, Conn.  | 3-49     | 5-69     |
| New Haven        | 5-69     | 5-69     |
| Boston           | 7-119    | 7-69     |
| Bethle           | 5-69     | 7-119    |
| New York         | 7-119    | 7-119    |
| Chicago          | 5-69     | 5-69     |
| Indianapolis     | 3-69     | 5-69     |
| Wichita          | 3-49     | 3-49     |
| Kansas City, Mo. | 3-49     | 5-69     |
| St. Louis        | 5-69     | 5-69     |
| Cincinnati       | 5-69     | 7-119    |
| Cleveland        | 5-69     | 7-119    |
| Columbus, O.     | 5-69     | 5-69     |
| Baltimore        | 7-119    | 7-119    |
| Dallas           | Under 3  | Under 3  |
| Fort Worth       | 3-49     | 5-69     |
| Los Angeles      | 7-119    | 7-119    |
| Seattle          | 7-119    | 5-69     |

Key to unemployment percentages:

|                 |                                |
|-----------------|--------------------------------|
| Under 3 percent | Tight or balanced labor supply |
| 3-49 percent    | Slight labor surplus           |
| 5-69 percent    | Moderate labor surplus         |
| 7-119 percent   | Substantial labor surplus      |

NOTE: Boston labor market was reduced to May to include Lynn/Salem.

turest subcontracting in any part of the aviation industry business. More attention should be given to planning by the small group of industrial subcontractors which might make up the right subcontracting people, as the fuel handling people or the hydraulic manufacturers."

But a spokesman of some major equipment people last week showed that most of these related knew pretty well what they were going to do, and far when, and were planning their own share in the experience.

- **The Job Ahead**—With figures of overall quantities planned for plane production still guided by the Defense De-

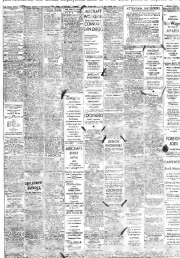
partment, relations were gathered in Washington last week as to the size of the job ahead.

Aircraft Industries Assn., estimated that an increase to a plane production rate about one-fourth of the peak at hand in World War II would meet the requirements now laid down. Peak monthly rate in World War II was 9113 planes. This indicated an expansion to approximately 930 planes a month, from a June rate of 215, with a yearly maximum rate of about 33,000 planes, as such a peak.

- **The Kick-off**—Throughout the nation, meanwhile, industrial companies



**JOBS-SEKERS** will attend employment office of West Coast plants in response to...



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strated the production half rolling. Here are some of their individual reports:

- **Pitt & Whitney** To fill Air Force and Navy orders for substantial quantities of engines and engine components, production lines are being accelerated, but schedule at Hartford depends largely on the pace which the engine manufacturer's 4038 suppliers of components and materials are able to set. New orders can be filled with only one additional plant, by putting operations on a three-shift five-day week. Pitt & Whitney is expected to expand into the Southbridge, Conn. plant, which it leased to World War II, as soon as the Navy acquires it from General Services Administration.

- **Boeing** Production centers around the B-47-40 which Westinghouse engine for the USAF and for the F-4D Turbo Warjet engine for the Navy. No new orders have yet been received for the new F-4E jet engine, but indications are that these will be forthcoming later.

- **Boeing** Aeronautical Co. Orders received in the past 10 days total over \$10 million, including the largest single order since World War II, to make air freight sections for Boeing C-97 transports. Current employment level of 1950 is expected to be built up to 4000, with approximately 1000 new workers needed in the next 90 days. Boeing has been building C-97 assemblies for Boeing for the last 10 months, but the new order will be a peak monthly production rate well beyond previous experience.

- **Tecon Engineering & Manufacturing Co.** Contract work on military transports has reached about 700 new workers since the Korean war started, and some of the work has been turned over to the company's subsidiary, Lancaster Airplane Corp. in Concord, Tex., where 150 new workers have been added.

- **McDonnell Aircraft Corp.** Announced \$175 million in Navy contracts before any other Navy contract would award it had received a letter of intent. McDonnell has received additional orders, presumably including the total will be made the early 1960s, which orders are principally composed of jet Korean bombers.

- **In addition to the Navy** Boeing jet fighter contracts, McDonnell stands a good chance to get Air Force contracts for the F-105 jet fighter. McDonnell is stepping up its production activities to be governed mainly by orders of supplier to provide equipment items.

- **Lockheed** Aircraft Corp. is keeping at the rate of 18 a day to meet stepped up production requirements for the F-94 jet fighter jet fighter, T-11 and T-12 jet trainer. F-94 sub-assembly parts









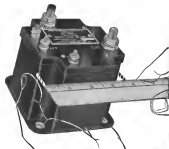












## Measure of Acceptance

Superior performance within the same size and weight limits is just one of the reasons why Hartman A-700A Reverse Cutover Cautions have made obsolete the first voltage types formerly used. . . why they are favored over military and transport aircraft generators than do all other models combined.

Designed to close on differential voltage between generator and bus rather than, as a fixed voltage, the A-700A cannot be used from all other caution devices. The A-700A cannot operate with any d-c generator up to 300 amp capacity having a normal regulated voltage of 28.5 volts. 600 amp units are available.

\*Manufactured to AN3023 (Spec. MIL-C-3026). Literature on request.

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# NEW INSPECTION METHOD



These four simple steps quickly inspect any surface for cracks, flaws, or discontinuities in any metal.

## Four Simple Steps for Easy, Economical Quality Control & Preventive Maintenance

The Dy-Check inspection process involves the use of three simple liquid components, non-corrosive and easily applied by brush, spray, or dipping. STEP 1—Clean surface with Dy-Check Cleaner. STEP 2—Apply dye. STEP 3—Remove excess dye. STEP 4—Apply white developer. . . indicates and indicates any cracks or flaws are present.

Requires no electricity, lights, or special installations. The only requirements for Dy-Check inspection are the three liquids, and simple equipment—such as brushes, sprays, or dip tins—for applying the liquids.



Complex problems solved in a single inspection. Any metal surface can be inspected without special equipment. Dy-Check is a low cost, simple process inspection system.

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## Revolutionary Dy/Check Process Quickly Inspects Any Metal For Flaws



DY-CHECK, THE DY-Check PENETRANT METHOD OF INSPECTION, permits surface inspection quickly, easily, and conveniently to inspect any metal for flaws or discontinuities having surface openings. Cracks, forgings, machined parts, pins, bolts, rivets, welds, . . . aluminum and its alloys, steel, cast iron, and its alloys, iron and its alloys, magnesium, nickel and its alloys, etc. . . magnetic and non-magnetic . . . all can be surface inspected by the Dy-Check process. The surface need not be smooth. Dy-Check is a proven, economical process developed by Northrop Aircraft Research, and is already widely used in many industries. (Pat. Pend.)



## Positive Dy/Check Indications Clearly Reveal Flaws

Dy-Check inspection reveals both the nature and extent of surface discontinuities. A Red Line indicates a crack, cold shut, or similar opening. Red Dots indicate pin or porosity. A Series of Red Dots in a Line indicates a tight crack or cold shut, or a partially welded lap. The extent of the flaw is and through the surface is easily estimated by the width of the Dy-Check indications.

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## Lab Pushes Work on Better Lubes, Fuels

Texaco Co. aims to keep product quality ahead of new equipment demands.

By Irving Stone

Research in aviation fuels and lubricants is being pushed at the Roscos, N. Y., laboratory at The Texas Co., to keep ahead of the mounting quality demands of engines and equipment.

The lab facility, which covers almost 200,000 sq. ft., recently was opened for inspection by the first time to a group of the aviation press. Approximately 75 percent of the facility's area is devoted to research in aviation products.

Because quality of Texaco's fuels and lubes finally are established at Roscos, the lab's testing procedures are necessarily extensive and thorough, and the quality control of the products is devoted to research in aviation products.

Because quality of Texaco's fuels and lubes finally are established at Roscos, the lab's testing procedures are necessarily extensive and thorough, and the quality control of the products is devoted to research in aviation products.

► **Turbine Combustion Studies**—A highlight of the lab is the gas turbine combustion facility.

Competition provided by 200-hp engines supply air for single burner runs over a wide range of simulated conditions. A preheated burner is the incoming air up to proper temperature.

Combustion studies primarily are concerned with effects of altitude fuel properties and the combustion of fuels and equipment design.

Currently, studies are being conducted on a Pratt & Whitney J42 Turbo-Wing combustion chamber to evaluate fuel performance up to 65,000 ft. Test runs covering 20 hours are conducted as an intermittent basis.

► **Engine Setup**—Studies of combustion in steady flow conditions are being conducted with a single jet, under constant with the Office of Naval Research.

A movable flame holder is used and a cooling static space downstream can be advanced or retracted to control exhaust temperatures. View ports reveal flame action.

► **CFR Studies**—A Cooperative Fuel Research engine, almost completely automatic, checks and checks quality of aviation grades.

Automatic monitors are used for water air temperature, fuel ratio, and dynamic fuel speed. An automatic reference fuel blender also has been used with the unit.

Special, high-output power sections



COMBUSTION TEST of burner on at Texas Company's lab. Two light spots below test cell window are quartz observation ports for visual observation of flame pattern within burner.

have been developed for the engine in steady state, closely conditions of actual aircraft operation. These sections and a smaller box lubrication studies, with separate control of oil flow and temperature.

In all, over 200 CFR engines are available for checks of aviation, automotive and Diesel fuels.

► **CUE Data**—A Cooperative Universal Engine checks both fuel and lubricants.

The special engine carries a full-scale aircraft engine cylinder. Speed, load, temperature, fuel-air ratio and manifold pressure can be varied independently over the full usable range of engine flight conditions to study wear-lubrication characteristics.

And lubricants can be checked on the basis of piston wear, combustion chamber deposits, ring wear, valve and guide performance, and bearing corrosion.

Work with this unit is not limited to fuel and lube studies. Frequently, mechanical defects of the power section components are traced to lubrication.

► **Fuel Oil**—In addition to bench tests, a Continental four-cylinder engine is used for aircraft engine oil studies.

Each cylinder can be held at a different temperature through a separate motor controlling cooling air flow.

This in effect allows test temperatures run to be conducted continuously.

Tests are also conducted for the company by Pratt & Whitney on Texas-owned engines. These checks are run in cycles simulating typical engine flight schedules.

Operation of jet engine bearings with low viscosity oils is another research phase. Because low temperatures encountered in winter operations and high altitudes require use of light oils, study is now progressing on how these lubricants also will stand up at high temperatures with high speeds and heavy bearing loads.

► **Gas Oils**, Gasoline—Current emphasis is on fuel problems of turbojet engines. Gas oil and gasoline are being performance checked under such conditions as low and high temperatures, high speeds and vibration.

A 16,000 rpm, several-gpm test with both fuels up to 1500 to determine effects on gear operation of oils and gears, tooth faces and face, material finish, speed and temperature.

A 16,000 rpm, test driven by a special Westinghouse motor is being used to investigate suitability of gears used in oil for ultra-high-speed bearing applications. Also to eliminate necessity for oil pumps, pumps, filters, gages, and various lines.

To explore the suitability of gears



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The same highly efficient J.M. Thermoflex Insulation which, in sheet form, is standard protection for exhaust cases and other vital parts of current model jets, is now available in preformed shapes for precisely any high temperature aviation insulation requirement.

Typical shapes are shown above. These preformed shapes are adaptable to such existing conditions as the protection of operating mechanisms in hot areas of turbojet and turbo-prop engines. The insulation of these ducts conduct air for cooling without ducts and the sheathing of structural members adjacent to an exhaust cone and tail pipes.

They also provide a practical solution to the problem of insulating the metal driving spools of both jet and propeller-driven aircraft, as well as

cockpit and cabin air conditioning and heating systems—particularly for distribution ducts (where temperatures exceed the limits of non-metallic covering materials), exhaust stacks and engine exhaust ducts of heating units, etc.

Each preformed shape consists of a Thermoflex asbestos felt, which is completely enclosed within stainless resistant Inconel or stainless steel metal felt in perfect protection of oil and other combustibles into the felt flow minimizes waste. All joints are sealed with a special adhesive material and assume ease removal for inspection. All joints can be precisely located during fabrication to accommodate providing connections, thermocouple leads, etc.

For more complete information, address Johns-Manville, Box 292, New York 16, N. Y.

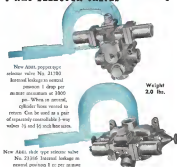


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# New ADEL Lightweight 3000 PSI SOLENOID, PILOT-OPERATED 4-WAY SELECTOR VALVES



New ADEL poppet-type solenoid valve No. 21780. Internal leakage in closed position 1 drop per minute at 3000 psi. When in service, cylinder lines vented to return. Can be used as a pair of oppositely convertible 3-way valves 1/4 and 1/2 inch line sizes.

Weight  
2.0 lbs.

New ADEL slide-type solenoid valve No. 23316. Internal leakage in closed position 1 cc per minute at 3000 psi. When in service, cylinder lines can be blocked or vented to return. Venturi available with centering spools or stems 1/4, 1/2 and 3/4 inch line sizes.

## CHARACTERISTICS OF BOTH POPPET AND SLIDE TYPE VALVES:

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- Produced for 12000 psi, 12 with optional available for other pressures.
- Available with or without manual control.

New designs are more compact, have low weight, longer service life, less maintenance, easy installation characteristics plus increased operating efficiency. ADEL's extensive engineering and manufacturing experience in Aviation Hydraulic Equipment makes aviation excellence of products.



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by jet planes and rocket motors, either inter or used to moderate bearing while subjected to temperatures of 900-600 F.

Another temperature check for gauges is in ball bearings at about 320 F. The test is run in 25 base cycles until failure is indicated by noticeable noise or by roughness in hand turning.

► **Traditional Service**—A very important phase of Tverov's Bureau Lab are the service conditions it holds with air base operating and maintenance organizations.

These "troubleshooting" sessions due to run out service difficulties and frequently indicate the electronic work around must take.

In every instance, the failure complaint and of laboratory's data is resolved (after extensive checking frequently involving metallurgical studies and physical property testing) as a mechanical difficulty stemming from component design.

## Model Tests Predict Spin Characteristics

Aircraft spin recovery characteristics can be predicted satisfactorily, says Bureau and of ten from spin tunnel tests of a scale model, says the National Advisory Committee for Aeronautics in a new report.

And for both tests, the model results are still useful in estimating some of the full-scale performance.

But for this claim is a correlation of full-scale and model tests of 68 different airplane designs, reported in NACA Tech. Note 1214.

► **Second Report**—The study is a follow up to an earlier memorandum which compared test results for 21 airplanes. But the engineers of this variable rotorcraft program the later, more comprehensive report.

Purpose of the investigation was to get a bench mark for assessing the accuracy of spin tunnel tests as a method of predicting the performance of actual planes. NACA analyzed the results of such tests, and compared them to full-scale aircraft spin data for 60 different airplane configurations.

Types studied varied from biplanes of the 1916 era to the supersonic jets of 1949.

In a limited number of cases, tests were made of parachute deployment for spin recovery. These studies predicted somewhat larger parachutes than were found necessary in previous flight tests.

There were some variations between full-scale and model performance. Most of these were small, and did not affect the overall conclusions arrived at in the study.

Here are some of the Test units which serve you at EEMCO

Shielded Chamber and Radio Noise Test Equipment—for checking a motor for compliance to radio noise requirements



Shaker Table—for testing motor shaking to withstand service vibrations.

Other Test Equipment not illustrated: Explosive Proof Chamber, Salt Spray Chamber, Oil-Injection, Signal Generator, 0-100-120V D.C., 50-400 cycle AC single phase and 3 phase power units, and all measuring instruments necessary to show compliance to requirements.

Sound Box—for amplifying all components of equipment to achieve test results.

Humid and Hygroscopic Dynamometer—for accurately checking performance of motors and actuators.

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Altitude Chamber and Cold Box for subjecting units to altitude and cold conditions according to ASHRAE and MIL-STD-883C.



Humidity Chamber 27°F humidity - 100° F



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Performance charts and design drawings illustrating solutions to difficult design problems will be sent to customers and engineering and design personnel making request to company headquarters.



Sound Box—for amplifying all components of equipment to achieve test results.

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POWERPLANT for D-55A-II during static firing in clamping attitude and (right) single rocket cylinder in conventional vertical test.



## RMI Rocket Test Stand Simulates Flight Attitudes

A rotating beam test stand, designed and operated by Reaction Motors, Inc., Rockaway, N. J., is representative of the many special-purpose devices needed by rocket engine developers.

Main purpose of the stand is to simulate changing flight attitudes during test runs on complete rocket power plants. Single rocket cylinders can also be fired into an Advance on the stand, without using the rotating beam. This facility is one of the outstanding design features.

Test and acceptance runs have been made on the engine installations of the Douglas D-55B-II Skyrocket and the Martin Viking.

► **Skyrocket Tests**—Firing of the Skyrocket motor was made with the beam

in a nearly-horizontal position. Engine components are stopped in the beam on brackets simulating their place in the aircraft. Thus, by rotating the beam either before or during the firing, airplane flight attitude effects can be checked.

► **Viking Vertical**—Precooled checks for Martin's Viking are performed with the rotating beam positioned in a vertical attitude.

The complete test rig, beam, pump, steam system and other accessories are mounted above the rocket motor just as in the aircraft.

Jet discharges from the rocket motor blast downward through a water-spraying ring to simulate an increased water resistance. Cooling water is cir-

culated at the rate of about 1800 gpm through the line.

► **Rugged Structure**—The rotating beam is mounted on a rugged 3-beam structure which is anchored in concrete.

Permissible thrust loading on the concrete is 75,000 lb., but it handles as large a static weight, since removal of the steel superstructure would be necessary.

Full torque and pump room are located in the concrete base of the stand. Insulation in the structure protects exhaust. Operators are about 200 ft. away in a steel-based control room.

Most of the current time is being used on acceptance testing of the 28,000-lb. thrust Viking motor.

## Magnesium Alloy Corrosion Studied

An intensive study of the corrosion of magnesium alloys, always a deterrent to aircraft structural applications, has been summarized by the National Bureau of Standards in its recent Technical Report 1364.

The investigation, carried out at the request of the Bureau of Aeronautics, tested samples of cast and extruded alloys under stress in both inland and marine atmospheres.

Of all specimens, MI-clad AZ13XA alloy was most resistant to stress corrosion.

Loaded to 30,000 psi (90 percent of yield) and exposed to a marine stress

phenon, the specimens lasted 530 days over the tolerance limit.

► **Samples Tested**—Sheet stock samples fired by the Bureau were MI, AZ13X, AZ51X, AZ61X, AZ62X, AZ63X, AZ64X, AZ65X, AZ66X, AZ67X, AZ68X, AZ69X, AZ70X, AZ71X, AZ72X, AZ73X, AZ74X, AZ75X, AZ76X, AZ77X, AZ78X, AZ79X, AZ80X, AZ81X, AZ82X, AZ83X, AZ84X, AZ85X, AZ86X, AZ87X, AZ88X, AZ89X, AZ90X, AZ91X, AZ92X, AZ93X, AZ94X, AZ95X, AZ96X, AZ97X, AZ98X, AZ99X, AZ100X.

Standard ASTM reduced section tension specimens were modified where possible to use grip ends of 1-in or 1 1/2-in width, rather than the usual 2-in width. Purpose of increased width was to minimize failure caused by stress corrosion around bolt holes.

► **Weighted Conditions**—Stressed and unstressed specimens were exposed to weather at the National Bureau of Standards in Washington and at Himp ton Falls, Va. At the latter site, the

specimens were on a platform built out over the tolerance limit.

Laboratory tests also were made with stressed specimens in a solution of sodium chloride and potassium chromate and by interconnecting specimens in a sodium chloride solution.

► **Conclusions**—The corrosion subject received generally to be aluminum. As the content of that metal increased so did the susceptibility to stress corrosion in solution.

MI-clad AZ13XA alloy proved to be the most resistant to stress corrosion. Among the untreated alloys, MIH sheet and ZK 60 extrusions were particularly resistant to stress corrosion.

Specimens stressed at the Washington site failed in shorter periods of time than those exposed to the same loading conditions in the marine atmosphere.



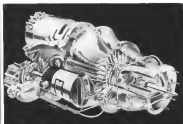
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COMPACT DESIGN of liquid Masquardt in turbine-driven accessory propulsion in thrust in cutting.

## Ram Air, Steam Drive Turbines

Announcement of the production and development of two accessory powerplants has been made by the Masquardt Aircraft Co., of Via Naga, Calif. These accessory drives can be powered either by ram air or steam from the decompression of hydrogen peroxide. Masquardt claims that horsepower output will be more than four times greater than that of conventional reciprocating engine auxiliary units.

► **Three Described**—Three different powerplants were described.

► **A high-speed ram air turbine**, which drives fuel turbines, pumps and a constant speed alternator through a reduction gear. It uses a hydrostatic speed control (also developed by Masquardt) which operates within 5 percent. This unit is for a Navy missile.

► **A ram (inductor) or steam drive** is an inductor which drives a high speed alternator direct. An electric gas turbine and turbine-motor (reduction) speed within 14 percent. Powerplant is rated for an Air Force missile.

► **A high-speed ram air turbine** which drives direct a large hydraulic fuel pump. This unit is for missile application.

► **A complete accessory drive** which has been designed to operate on either ram air or hydrogen peroxide.

► **Logistical Choice**—The use of ram air or steam is a driving reason for the turbine is a logical design choice. High speed accessory can either bleed air from the jet compressor section or use ram air to take it on board. Masquardt can use either ram air or steam from the new hydrostatically driven plant (hydrogen peroxide with a catalyst).

Masquardt says that the amount of air

exhausted by the turbine. One model does this by a bullet shaped ductile of the air intake.

Installations of these powerplants can be made at remote points, with no supply through a system of ducts. In this case the advantage of a distant location would be weighed against the disadvantages of ducting losses.

## Aero to Operate AF Development Center

The growing trend toward operation of government research and development facilities by private management corporations under contract is spotlighted by the recent designation of New York, a Tennessee corporation, to run the Aero Engine Engineering Development Center, near Baltimore, Tenn.

Major reason for this type of contract action is the ability of private corporations to offer more effective solutions to research than could be paid if the facility were government operated and subject to Civil Service pay limitations.

Mr. Gen. Franklin G. Carroll, commanding general of the AEDC, will have charge of programming the tests to be performed at the center. But the actual testing will be done by the contractors personnel under direction of David Roy Shultz, Aero director of Engineering, formerly associated with General Electric and Bell Aircraft. Aero is affiliated with the St. Louis engineering firm of Bendrop and Parrell, Inc.

The AEDC setup is expected to get all clearly underway when the Atomic Energy Commission has with private corporations to operate its facilities.

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**Boeing Stratocruiser**

## Turbine Transport Airworthiness

Suggested certification requirements offered as stimulus to industry by CAA's George Haldeman.

The Civil Aeronautics Administration is hitting the hay crows from the turbine transport scene.

It doesn't pretend to leave all the answers to the numerous airworthiness problems the high-speed, high altitude can well bring. But it is looking there which were capable of being reached now. Other solutions will have to be left to development during the certification procedure and operational testing program.

George W. Haldeman, chief of CAA's aircraft division, noted some of the most pertinent considerations at the recent annual national meeting of the Institute of the Aeronautical Sciences in Los Angeles (Aviation Week, July 20).

The solutions advanced were not offered in a rigid line of thinking, but rather as a guide to stimulate discussion with industry and questions to that airworthiness requirements for commercial turbine-powered may be obtained efficiently and in sufficient time. Here are some of the problems Haldeman mentioned.

**Speed Factors:** Higher operating speeds of turbine-powered craft will require re-evaluation of structural design criteria in present Civil Air Regulations. Design speed for large civil or high lift devices should be selected by the designer but probably should not be less than 1.5 the stalling speed of the plane in the configuration specified for the particular condition.

That speed should be sufficient where flap are used for high lift devices alone. Speed between design speed for maximum gross (40 g's) and design cruising speed should account for the time required to slow the airplane to the single air speed, and account for the rate of increase to design cruising speed as the rate of spiral of speed for emergency gear.

In selecting the design cruising speed, the value should be high enough to cover the speed between it and design speed for maximum gear and be close just with actual plane performance.

Suggestion was that this value be at least equal to the speed corresponding to maximum cruise power, plus an increase of Mach .05.

For aircraft with designed dive speed Mach number under .65, prohibitive no change will be necessary for present design code and design dive speed relationships.

The value over Mach .65, an adequate margin between these two factors will probably be needed to insure that de-

sign dive speed will not be exceeded. The amount of speed should take into consideration design provisions to limit speed.

**Maneuver, Gust Envelopes:** The high speed of the jet craft will involve a larger turning radius, hence decreasing maneuverability. With carefully controlled operation, an increase in maneuvering load factor may be required, otherwise, an increase in the present 2.5 G maneuvering value for design will be necessary.

Determination of minimum lift coefficient and variation of other aerodynamic parameters probably will make it impossible to reach a load factor of 2.5, say, 40,000 ft. If that it may be desirable to check for one factor load factor that can be achieved in a non-precision with banking loads.

Repeats of severe gusts encountered at 40,000 ft. seem to clear any doubt regarding the advisability of using statistical methods as a basis for selection of gust strength criteria.

In the absence of further information it may be advisable to consider that the magnitude of gusts are represented in those specified for sea level, with no change for altitude.

**Aerodynamic Forces:** For the high Mach number transport, difficulties of predicting compressibility effects, and greater confidence in stall and load characteristics in configuration, indicate that specific wind tunnel test data can be acquired as a minimum to determine design air loads.

**Structural Flight Tests:** In accelerated flight, a high speed plane may show undesirable landing characteristics or excessive critical loading or vibration conditions. Because it is difficult to capture accurately these dynamic conditions, the limit loads of the V-G diagrams may have to be established in structural flight tests.

Buffering and a more critical conditions may require certification of an operating V-G envelope.

**Speed Control Flaps:** Unless revision is made to satisfactorily limit undercarriage speed pickup, the high-speed craft probably will require an approach or exceed design never-exceed speed.

One basic type speed control flap is an air brake, but any device utilized should have full effect at 5 g's.

**Braking:** Because of higher climb-out speeds, efficient braking will be needed for discontinued takeoff. Absence of reverse prop thrust will also be a limiting factor.

A basic standard device may be re-

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quered, also two locking systems if a supplementary slowdown means is not used.

► **Emergency Egress—Speedy emergency evacuation of passengers and crew will be a prime consideration—** and for price, and I am told for all, appearing feasible. A few larger doors seem more suitable than many smaller openings.

Control opening doors may be required for added safety because of pressure differences in flight. But even so, opening may affect quick egress, exit approaches would have to be unobstructed.

► **Oxygen—To cope with explosive decompression above 25,000 ft., immediate supply of oxygen will be a "must" for passengers and crew.**

Possible solution: passengers be given masks and instructions before going above 25,000 ft. (method would have poor psychological effect), flooding of cabin with oxygen (may be impractical at extreme altitudes because of large supply necessary involved). Or structure could be made sufficiently strong to eliminate possibility of explosive decompression, strengthening would be additional weighting equipment over that now required.

► **Acceleration—Quick acceleration of the engine, particularly in short-notice landing procedures, will be an important consideration.**

This problem could be resolved with special devices, specific operating procedure, and/or tests.

Four critical performance of the turbine plant will warrant some means of thrust augmentation. Methods available now for this purpose are turbine burning, water injection of JATO-type boosters.

► **Blowout—Combustion failure at higher altitudes will be another problem. Solutions point to improved chamber design, variable-area fuel control, and fuels for better efficiency at altitude.**

► **Reliability—This will be a prime consideration for turbine plants.**

It must be shown that they will give reliable service between overhaul periods, with ample chance of breakdown. Initial overhaul periods will have to be conservative, with overhaul time extremely justified only by service experience.

► **Fuel Factors—Storage of fuel in turbine transports will pose difficulties. If fuelage tanks are fuelled, these provisions will have to be considered: tank protection for crash landing by placing adequate structure between tank and exterior, tank to be sufficiently strong to withstand forces in a crash in which passengers could survive. (Availability of 200 valves should be checked), sufficient isolation and ventilation of tanks, restriction to use of low-volatility fuel to**



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centrifugally cast rings based on view of suitability of this type of tool for turbine engines.

► **Iceing**—Control of iceing on turbine plants apparently will pose greater difficulty than with piston engines.

Advantages and performance loss with electronic sensors are being checked by research groups, together with these weighting schemes (boosting inlet air temperature (bleed), heating hollow inlet vanes, inertia separation, electric heating, resistant coatings, alcohol injection for compressor inlet, oddly curved heat (superheated), and removable inlet screen).

► **Fire Systems**—Satisfactory detection and extinguishing installations will be key considerations for commercial turbine transports. Whittier operators have turned up fire difficulties with the turbine plant.

Vanes and lightweight firewalls will be required, and additional drains and weight savings will be necessary to maintain fire hazard.

► **Windmilling**—Means will be needed for turbine windmilling control because a failed engine will introduce drag, danger of damage to engine and structure, and likelihood of fire.

Trouble solutions, use of a foot valve, anti-cavitation, or backing.

► **Temperature, Humidity**—Temperature and humidity effects should be considered for temperature above freezing (and) until expensive warnings, no credit should be allowed for temperature below freezing because of the icing danger.

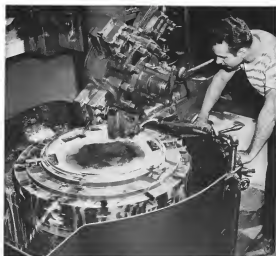
► **Takeoff Push**—Normal operating climb-out speed probably is considerably higher with the turbojet plant than with the piston-turbo unit, hence, the all engine takeoff flight path may be more critical in some cases in the field where obstacles usually are avoided by a climb instead of turn.

Superiority is that the manufacturer's airplane flight manual schedule for all engine climb flight path from the field's end, with acceleration, pointed along the path to a sensitive climb-out speed and including the gradient of climb with maximum continuous power.

This will permit scheduling of adequate obstacle clearance and airport gates with correct normal operation.

► **Engine Failure**—Engine failure early in the climb run, particularly with the turbojet, might not be recognized quickly because of the slow acceleration and the close exhaust engine grouping, which reduces effect of asymmetrical thrust. These conditions will vary with the particular plant.

One solution was a selection of an engine-bleed speed at a low value, where acceleration-stage distances would not be reduced, only the distance to climb to 50 ft. would limit field use.



## CENTRIFUGALLY CAST IN STAINLESS...

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No ordinary metal can endure the terrific heat and corrosiveness of exhaust gases that blast out from a jet engine. That's why Pratt & Whitney uses an austenitic alloy containing 25% chromium, 15% nickel and 5% tungsten for jet engine exhaust rings.

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a special centrifugal method at The Cooper Alloy Foundry Co., Hillside, N.J., and The Dursley Company, Scotland, Pa.

The picture, above, shows the final machining operation on such a flange for a Turbo-Wasp J-62 engine. Each casting is very carefully inspected to insure freedom from defects.

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Best approach for the present may be to judge each case separately.

► **Tailoff Climb Speeds**—CAA hints to the airman that for tailoffs, the maximum tailoff climb speed should be 1.1  $V_{LO}$ , stall speed of the plane in the configuration for the particular condition, regardless of number of engines. Further, that it be not less than the best angle of climb speed whether the tail is a tailgust or tailgrip.

► **Climb-Percent** climb requirements are satisfactory for tailoff climb speed considerations. This is because the tailoff climb requirements and tailoff path requirements are considered at the same speed.

Two does not hold for approach and landing climb requirements since regulations are parallel to those to be demonstrated at best rate of climb speed, which may exceed considerably the approach speed in landing distance demonstration.

► **For climb speeds** for demonstrating approach and landing climb, CAA suggests that maximum be limited to 1.4  $V_{LO}$  and 1.1  $V_{LO}$ , respectively, unless a higher speed is used in landing distance demonstration, when the higher speed could be used.

► **Landing**—Until complete data is obtained on landing field length requirements, CAA suggests maximum speed in landing distance demonstration

should be comparable with speed that would be used in ILR landings at the maximum glide angle of approximately 3 deg.

Also, this speed should not be less than it is used in demonstrating balked landing or approach climb-out-and-abilities can be shown to attain the desired climb conditions at this approach speed with altitude loss of not more than 25 ft or distance of not more than 2000 ft from instant of power application as available engines.

Reverse thrust and maximum braking capacity will require careful study.

► **Stall**—This condition has problems inherent still characteristics of the swept wing and effect of pre-stall and stall buffeting on the structure.

Because of wing flexibility plus occurrence of loss of lift, rolled and possibly uncontrollable pitch may be anticipated at stall, with a serious loss of altitude. Solutions advanced include development of auxiliary lift devices, such as extendible leading edge slats and flaps, section boundary layer control, drop nose flaps, and leaves.

A buffet that gives adequate stall warning on present day transport wings, may introduce dangerous vibrational loads on high speed aircraft wings because of heavier flexibility, particularly if aspect ratio is high.

► **Stability, Control**—Active effective two in reduced sensitivity at low speeds requiring large deflection angles for sufficient lateral control. And tip stalling may be expected in basic swept wings with about 25-deg sweep.

Here again, auxiliary lift devices will play an important part in restoring stability and control.

CAA feels that a positive stability requirement should be considered from 1.1  $V_{LO}$ , stall speed in landing gear retracted to  $V_{LO}$ , (zero engine thrust). ► **Operating, Design Speed Range**—A most urgent problem arises because a jet transport is most economical and efficient speed is about 80-95 percent of maximum speed, depending upon each initial design. Present  $V_{LO}$  (maximum structural cruising speed) concept probably will not be retained for a majority of the craft because  $V_{LO}$  would require variable cruise with  $V_{LO}$  (maximum speed) for various power plant plans. And  $V_{LO}$  (design dive speed) probably would be limited to some degree, by loading qualities instead of structural considerations alone.

► **Flight safety** equivalent to that of present piston powered craft could be shown, it would seem reasonable to reduce the  $V_{LO}$ - $V_{LO}$  spread to an absolute maximum and eliminate the specific  $V_{LO}$  by consolidating the intent of  $V_{LO}$  and  $V_{LO}$ .

Study may show that this could permit the more efficient speeds with an flight safety compromise.

# SWEDLOW Spells SAFETY in the Fairchild C-119 Packet!



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Among other notable developments in which SWEDLOW PLYON had a share are the latest advancements of

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- Republic Aviation Corp.
- Consolidated Valves Aircraft Corp.

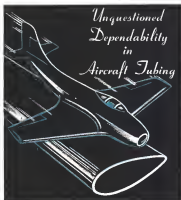
The valuable cargo — in both human lives and material — of A. A. F.'s Fairchild C-119 Packet, is protected by PLYON\* fuel cell backing — the plastic backing for self-sealing fuel cells, in accordance with A.A.F. Spec. 120402.

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There's nothing like a cocktail of that super-powerful Gulf Aviation Gasoline and some perfect flying weather to coax a cup out of the most phlegmatic flier.



All of which brings us to today's lesson in common sense: You'd better fly a flight plan!

There's just no case something unexpected happens enroute, ARS (Air Rescue Service) will find you in hours, instead of days or weeks later.

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## Control Complexity on Brabazon

Flight engineer's position on the Brabazon I is a clean—but badly compartmentalized—complex mass of instrumentation and controls.

General view of installation is L shaped, with a row of eight engine throttles placed at left. Engine master cautions is above throttles.

Instrument panel at upper left contains five cylinder-pressure controls below standard fuel-pressure panel.

Need section, reading clockwise:

around the L, has eight pressure controls mounted on deck and panel immediately above.

Engine oil and coolant systems and water-miscibility are on upper half of panel and instrument section.

Third row contains fuel-system dash, above, with panel below instrumented for de-ice, control board, brakes and radio.

Cabin configuration control center is at extreme right.

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CUMULONIMBUS clouds in area from aircraft (left). Flare clouds 10,000 ft., cloud top 25,000 ft., base 2300 ft. Photographed from height of 28 mi. Display on radar scope (right) shows response at 75 mi. from cumulus clouds at 50 mi. left of photograph.

## BOAC Comet to Get Search Radar

Operational tests prove EKCO unit's value as storm cloud, obstacle detector; 'map-painting' use seen.

Airborne search radar, an instrument with which the airline industry has long flirted, has at last been purchased for operational use by one of the major airlines, British Overseas Airways Corp., for installation in the de Havilland Comet and other aircraft.

The device, highly effective by day or night, is especially significant when used at high speed, high altitude places, the airline says, since the aircraft safety factor will be improved, passenger comfort increased, and greater schedule regularity assured.

**Visual Statistics**—EKCO Global and Colibron. Warning Radar Equipment Model No. E315, is manufactured by E. K. Cole, Ltd., Whitebury, Wiltshire, Eng. It is a 5 cm. radar system based on a British government's Television transmitter. Research Establishment design and is intended primarily for the detection of weather patterns directly and lateral areas of intense turbulence associated with such clouds. Engineers concerned with jet transport development long have been aware that a way must be found to avoid highly turbulent conditions due to intense stresses imposed on the airframe. The set may also be used for detection of high ground, obstacles, and other aircraft and provides "map-painting" facilities for navigation.

**Weight** of the complete installation, less second connecting cables, is approximately 155 lb. This weight is

deducted 10 lb. if only one indicator is used.

**Power supplies** required are:  
• 115 v ac (1600 c), 320 volt/ampere  
• 115 v ac (1600 c), 400 volt/ampere  
• 24 v dc, 6 watts

**Sealed and pressurized components** include: Transmitter receiver, antenna and associated units, power supply station to at least 40,000 ft. Unsealed, the units operate satisfactorily to 25,000 ft. Since indicator and control units would normally be mounted in pressurized parts of the aircraft, the antennas are left unsealed.

**Transducer and control components** are hermetically sealed and temperature



MAPPAINTING: display of French coast. Scale also mist shown at right.

may have been taken into account.

**Temperature** from -55 to -43 degrees C. do not require performance of the unit.

Field test gear provided with the set consists of a monitoring unit which is externally a multi-voltage voltmeter. It can be connected to the transmitter-receiver unit through a 12-way plug. Measurements of the more important supplies can be made without relieving the T.R. from its scanner or de-coupling the transmitting.

Facilities are also provided for in situ control testing.

**Performance**—As a result of extensive tests in cooperation with BOAC, EKCO announces the following performance for the equipment:

• **Cloud** data, such as clouds were detected up to 40 miles.

• **Low, steady** beaches appeared at between 10-40 miles, depending on presence of vegetation, etc.

• **Surface** dips and planes were detected at varying angles—25 miles being typical for an average-size ship, 15 miles for a large aircraft and five miles for a small plane.

• **Clouds** which could not be picked up at a range greater than ten miles were not considered dangerous and were said to be unlikely to cause more than slight discomfort.

**Outlines** of the radar for "map-painting" is enhanced by incorporation of good magnification for the observer within the limits of  $\pm 10$  degrees in pitch and  $\pm 45$  degrees in roll.

**Components**—The actual system proper consists of an 18-in. paraboloid, illuminated by a bakelite dipole and reflector. This assembly scans over an

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are of 150 degrees in azimuth over the whole, providing a cone of R.F. energy subtending an angle of approximately 5 degrees, sweeping 75 degrees on either side of the line of sight of the aircraft. Provision is made for tilting the paraboloid relative to the dipole system so that the plane of scan can be brought above or below the horizontal. The degree of tilt is indicated by a full meter on the control end.

BOAC has conducted thorough operational tests of the equipment aboard Hythe flying boats in the Far East where severe thunderstorm areas are encountered, in Viking aircraft operated by the firm's Operational Development Unit at Hahn, Eng. It is now fitting three sets to its new Hercules transports for intensive flying with company air crews.



GYRO-STABILIZED transmitter receiver now standard on most of Hythe flying boats

- Easy accessible welding with
- Ease of maintenance, being removable without connector disassembly.

The units are designed to meet "M" connector specifications in accordance with Aeronautical No. 1 of the latest military specification for electrical connectors, MIL-C-5015.



### Nozzle Tester

A sonic for spraying liquid into a fan-shaped array of tubes in the heart of a new method devised by engineers at the Boeing, N. Y., laboratories of the Boeing Co. to determine conformity of fuel distribution.

Open ends of the tubes, collect liquid from the nozzle in a graduated glass vial. The amount in each and indicate clearly the spray pattern of the nozzle being tested. A slight vacuum in each vial facilitates the flow of fuel through the tube.

The set is used for both intermittent and steady-flow models. Knowledge of fuel spray patterns of nozzles used in jet and reciprocating engines is important because of its bearing on efficiency with which fuel is burned and hence the thrust or power output and economy.

### Air Force Buying Scintilla Connectors

Electrical scintilla connectors resembling "Scintilla" rubber tube detector and cable gripping parts are now being procured by the USAF in great quantities for electronic equipment.

Scintilla Magnetics division of the Benja. Franklin Corp., Rahway, N. Y., manufactures the connectors and claims they provide excellent resistance to moisture and vibration.

Cadmium-plated stainless steel shells and the "Scintilla" body (chloroprene) meets Self-aligning contact feature.

• Springs designed to provide minimum voltage drop without high spring pressure.



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It is well known among aviators of all types of planes that Packard aircraft cable gives more hours per replacement.

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## NEW AVIATION PRODUCTS



### Swallows Noise

An exhaust muffler which reduces aircraft engine noise about 60 percent reportedly will soon undergo evaluation by the FAA on a DC-3 transport.

The muffler is a development of the Aero Space Corp., 99 Murray St., N. Y. It already is approved by the FAA for use with Pratt & Whitney 450 hp Wasp Junior engines.

Aero Space says it is designing other mufflers which can be used with smaller engines and on large transports. For the 450 hp engine, the device is 55 in. long, 5 in. in diameter and weighs 35 lb.

The company explains that no muffler can be used to cut down noise. Instead, it suppresses it accomplished through use of stainless steel blanketing. While it is highly effective in cutting noise, the new muffler does not reduce engine power, the firm says.

The unit in the direction of Eddy D. Lefebvre, Aero Space's general manager. Basic design consists of a tube mounted within a tube with a Venturi-shaped tailpipe to induce a pressure in surrounding gases from the muffling chamber.

The outer stainless steel pipe is insulated with 4 in. steel wool and has an inner wall which is perforated. The inner pipe is, in effect, a second tube of steel wool with a perforated outer casing and inner wall giving a total of three surfaces of 1200 in. in and much 93-000 perforations to absorb the noise as it passes through the muffler.

Aero Space says tests showing the device reduced engine noise by as much as 60 percent were conducted by the College of Engineering of New York University. After a recent demonstration of the muffler to officials of the FAA and AeroSpace and other officials in Washington, D. C., J. B. Hartwell, Jr., executive director of ADPA, is quoted by an Aero executive as saying: "We are extremely impressed with the Aero Space device and are serious

to encourage the use of this or similar devices among private and commercial aircraft users."

### Loads From Bottom

A system of loading fuel tanks from the bottom, similar in operation to loading an aircraft, has been adopted by Shell Oil Co. at Wilmington (DE) Airport.

Shell says the new technique is safer, easier and more economical than the present method of filling tanks from the top. The driver doesn't have to climb up on his truck to complete filling operations. Conventional overhead loading racks have been avoided.

As an added bonus, the appearance of the tank storage area at the field has been improved. Storage tanks, built underground in the ground, had lines and sight-lighting units are neatly arranged in compact groups.

An important feature of the new system is a novel coupling and valve arrangement linking the bottom of the tank with the storage tank delivery hose. This device permits delivery and "positive" excellent control of the flow of gasoline. A safety valve at the top of the tank prevents overflow.

Shell took the change-over to the bottom-loading technique at Wilmington Airport "only had to rearrange of existing track loading facilities at other airports."



### Rubber Drive Wheels

Good traction under all types of service conditions is the major point of a new driving wheel developed early this year by Douglas Aircraft Co. by the B. F. Goodrich Co., Akron, Ohio.

These units are four rubber tires (bullet wheels) which serve as driving wheels for two electrically operated control units in the C-124 Globemaster. The tires were designed to

meet tight traction specifications, as well, in fact, that design and rubber composition problems presented in their development "usually baffled rubber men," according to Goodrich.

The rollers are made of a new rubber compound which permits them to maintain constant traction. They withstand low and high temperatures ranging from -60 to 140 F. without shrinking from the traction surface. They also must withstand high yields without permanent set so that traction will be adequate while operating on surfaces that may often be as greasy as 6 percent.

### ALSO ON THE MARKET

Flame-retardant plastic insulation for electric cable has been developed by Du Pont. Called Neolon, product will not drip when melted, can be extruded at high speed or injection molded. Electric properties are comparable, but not equivalent, to those of polyethylene. Address: E. I. du Pont de Nemours & Co., Wilmington 98, Del.

Corrosion-proof instrument tubing, called Neolon, is made of metal protected by thin coating of fluoropolymer. Makes tubing can be bent easily without dropping plastic coating. Address: Samuel Moore & Co., Mentor, Ohio.

Magnetic-particle detectors, used by the Navy for control of radar and other equipment, now are offered to industry for maritime coastal applications. Device uses mixture of iron particles and fluorophosphate in magnetic field to link diving and driven parts. Addressing: Victor Electronics division, Victor, Inc., 1815 Locust St., St. Louis, Mo.

Impregnated glass fiber material covers in machine-made rolls. Product contains a polymeric compound, including catalyst, in a dry state. To form into parts, such as structural housings, material is removed, laid on die to proper thickness and heat cured by conventional means. Use of "Drypak" reportedly removes need of making "muddy wet lay-up" by hand. Address: Plastics Products, El Monte, Calif.

New keyless drill chuck can be used with drill presses, lathes and milling machines. Drills, reamers, and other types of drill bits and shanks are inserted and held tight—locking mechanism actuates control tool and auxiliary lighted chuck grip. Address: Elbro Tool Co., Inc., 604 Johnson Ave., Franklin 6, N. Y.



### On the Lockheed F-90

An essential feature of the pressurized air conditioned cockpit of the new Lockheed F-90 is the windshield of bullet and ball-resistant multiple safety glass. This is a typical example of Pittsburgh's ability to meet the exacting requirements of aircraft manufacturers in safety glasses and glazing techniques.



## Safety Glass

BY PITTSBURGH

Many important advances in aircraft performance have been made possible by Safety Glass and glazing techniques developed by Pittsburgh.

As airplanes rise to higher speeds and higher altitudes, windshields and other vision panels are subjected to greater pressure, higher temperatures, increased abrasive action. To meet these changing conditions, Pittsburgh maintains an aggressive program of product development, applying proven engineering principles in the solution of new problems as they arise.

On practically all current models of military and large commercial planes, you will find aircraft type Safety Glasses, transparent laminated

plastics, photographic glasses, pressure bullet- and bomb-resistant glasses and double-glazed Safety Glass—all developed by Pittsburgh—as well as improved glazing techniques which can bear ample impact and structural strength with both resistance of multiple curved panels.

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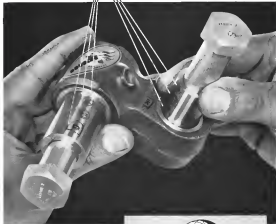
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## AIR TRANSPORT



INTERIOR ARRANGEMENT of the 4-0-4 is shown in cutaway drawing (left). Baggage, cargo space and galleys are forward between cockpit and main cabin, over-on baggage lavatory and toilet in loading area aft. Unusually wide C-G range (115 to 183 percent MAC) is illustrated by sketches (right). Automatically variable angle of incidence of tailfin allows wide variations in landing conditions.

## Details of New Martin 4-0-4 Disclosed

When the Glenn L. Martin Co. delivers the first 4-0-4 to Eastern Air Lines and Trans World Airlines next spring (Aviation Week May 8, p. 14), these carriers will be getting a modified and improved version of the tried and proven Martin 2-0-2.

The main difference in configuration is a 79-in. lengthening of the 4-0-4's fuselage, giving the plane a seating capacity of 60 instead of 35.

Major operational improvements in cabin pressurization, permitting cruising altitudes of 16,000 ft with cabin altitude of 8,000 ft. The Afterswath cabin supercharging and air conditioning equipment will, in addition to providing pressurization, supply ground cooling and dehumidification (with night engine operating), an important consideration for passenger comfort.

►Features—The Martin Co. points to the following interesting features:

►Ease of maintenance. Individual sections doors, overheads placed, permit simultaneous servicing of all primary systems. Mowing tool cuts are easily removable.

►Fast loading. Bulkhead and loading ramp elevators meet the unit at almost any angle and make up most steps of the machine or less provided.

►Public address system. Pilot or air attendant may make announcements to passengers and call their attention to points of interest.

►Martin's design. Unusually short span of almost permits use of existing type which are double-ducted giving plane a stalling speed of 75 mph at sea level, such as C-G and 16,000 ft gross weight.

►Statistics—Takeoff weight will prob-



COCKPIT INSTALLATION. Small window shows windshield; two bars eliminated and forward and side window panels retracted to provide greater visibility. Lights and handles along instrument panel divide up the working instrument and emergency panels.



HIGH DENSITY VERSION of the plane can accommodate 52 passengers in illustrated.

ably be 41,000 lb., landing weight 41,000 lb., high speed 312 mph, cruising speed 250 mph (at 12,000 hpf), operational range 900 mi. with payload.







[illegible]

The *Shoreland Addressing Map System* is a land-use map of parcels and nonpoint-source areas that the county itself has been able to create using remote sensing and other data. The county's GIS department has been able to create this map using data from various sources, including aerial photography, satellite imagery, and ground-based data. The map is a valuable tool for the county's planning and development efforts.

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The jury record represents an increase of more than 100 percent over a similar period last year. Average load factor was in excess of 79 percent. The railroad has more than 550,000 miles of track.

An off-agair, on-agair Civil Aeronautics Board decision last week told National Airlines without the New York-Miami daylight air coach service that a suspended and later was forced to cancel.

The Board revised staff, dropping National the air coach service, 45 hours after it had originally approved the service, a National spokesman said. The reversal came on the back of a protest by National's principal competitor, Eastern Air Lines, against the daylight coach service.

Natural lost two legal maneuvers, in the U.S. Court of Appeals for the District of Columbia and in the U.S. District Court, when both courts refused to issue restraining orders barring the renewed decision. G. T. Baker, Natural president, said the airline would have to stand on the Board's decision until further legal action could be taken.

The 100-ton graving National the right in the service was handed down Aug. 2 by a two-to-one final decision with Acting Chairman Oswald Rees, one on voters. National immediately spent \$4,000 to advertise the service and sell tickets for the first fights scheduled to begin last weekend. On Friday, one member changed his vote, overturning the decision, National said, and the union's proposed service was suspended for 90 days, pending an investigation.

► **An Ounce Review**—The Board's announced reason for changing the decision was because it planned to review all check orders presently before Sept. 30, a date at which many temporary certificates expire. Therefore it was suspending the National service pending the annual review.

Baker and National had spent \$4 million buying 60 passenger Douglas DC-9s on cash plans for the service and the airline had originally proposed a \$5 fine for the nonstop daylight coach service, but that the Board had forced the rate up \$5. "We agreed reluctantly, but with every intention of rebelling in the lower fares," he said.

## SHORTLINES

► **Air France-And Trans-Canada:** Air Lines will fly the first air route connecting France and Canada, under a bilateral agreement signed last week by representatives of the two nations. Agreement grants rights for Air France to fly into Montreal and Trans-Canada into Paris.

► **All-American Airways**—This line authorized by Civil Aeronautics Board to suspend service temporarily at Beloit State College, Pa., for a year or until an adequate airport is available for regularly scheduled operations.

• **American Overseas Airlines**—Will begin first through air service between New York and the West German cities of Düsseldorf and Cologne Sept. 2. Service will be twice weekly with 44-passenger Constellations. It represents percent New York/Frankfurt daily schedules of AOA.

► **British Overseas Airways**—Carried over 40,000 passengers and flew 162 million passenger miles in the first three months of 1950, showing a 36 percent gain over passenger miles flown in the same 1949 period.

• **Delta Air Lines**—Civil Aeronautics Board has denied its application to serve Monroe, La., as an alternate intermediate point between Shreveport and New Orleans.

► **Mid-Continent Airlines**—Will start service over a new Saint City-Chicago route, and over Rockford-Milwaukee portion of its North Central routes Oct. 1 using 21-passenger DC-3s, available since the recent purchase of last 40-passenger Convair Learsy aircraft. One of the DC-3s for the new service.

► **Northwest Airlines**—Is establishing eastern regional and local sales, reservations and publicity offices on the 14th floor of the 515 Fifth Ave. Bldg., New York City. Company will consolidate all its New York functions, except ticket offices and airport installations, in the new office. Newly created eastern re-

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A lot of water has passed under the beams of Edo films since the first screw-taped panoramas were designed 21 years ago. Today, of course, those early Edo films, some of which are still in use, look crude in comparison with the sleek Edo's now being all over the world. And, sadly, they were ahead of their day, for their all-American construction made them lighter and stronger than mediums available anywhere.

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personal sales efforts will have charge of sales in eastern U.S., British Isles and Europe.

Company has associated a new flight instructor service in its operations with American Mail Line. This will be taught to pilots from the far Pacific to be brought to Port and Seattle by the company's company. From these points they will be taken by Northwest to Chicago and to New York. Northwest's Continental Express line will be used. Service is expected to speed deliveries and simplify paperwork for shippers.

►Subaru (Jap) has been offering the consultation service of its Japanese representative, Raymond Hodge, in New York for travel agencies and domestic airlines. He has made a comprehensive report on U.S. cities, discussing up American tourist travel to Germany.

►Southern Airways (Atl) received approval of its certificate from Civil Aeronautics Board, authorizing additional air service in several Southern states including service between Memphis and New Orleans via Cleveland, Cincinnati, Washington, Baltimore and Baton Rouge, and between Columbus, Miss., and Mobile, via Jackson, Laurel and Hattiesburg.

►Transocean Air Lines (Lm) has been granted temporary exemption from Civil Aeronautics Board limitations on the number of flights it is authorized to operate carrying refugees from Munich, Germany, to the U.S. The carrier will be permitted to operate four flights a week, for the next six months, under contract with the International Refugee Organization.

►Trans World Airlines (N) 12 new Martin 2-0 2A will be put into operation to be served by the planes, between Aug. 15 and Sept. 1, when the planes are due to begin scheduled passenger service. Purpose is to replace the existing 12, and part and maintenance training.

►Company is negotiating a direct sales office at Seattle, at 121 Second St., with Charles E. Longue as agent. The new Northwest district is being established as a service to the area, and in recognition of its great travel potential, although the city is not directly on TWA routes.

## CAB SCHEDULE

Aug. 14—Continuation of service on the part of Transocean Airways (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 15—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 17—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 18—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 19—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 20—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 21—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 22—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 23—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 24—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 25—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

Aug. 26—Continuation of service on the part of West Coast Airlines (Lm) authorized and service operations at Seattle, Canada Air Lines service in this area. (Continued 2113 to 211)

## airline installs EDISON fire detection to cut mechanical delays

According to an article in Aviation Week\*, one of the major U.S. airlines, after an evaluation of current fire detection equipment, has selected Edison as its new standard for the critical Zone I of twenty-three DC-4's.

The article goes on to state that the "decision is timed directly at the bugloss of every airline—time lost through mechanical delay. . . . It is anticipated that the airline will quickly pay off the cost of the new installation in time saved."

This airline was one of the very few remaining not already using Edison Fire Detection.

\*Issue of November 26, 1959. Page 20 of this article will be sent to you upon request.

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# What's Ahead in Military Equipment Buying

## How to Spend \$3.5 Billion

With a pocket-bulging backlog of \$7.7 billion, the Air Force and Navy have started shopping for aircraft and equipment. Experience and established routes tell them where to go for the planes.

But a revolution may be brewing in the purchase of equipment for these planes. One out of 2 is now bought by the government and furnished to the airplane builders. Now the trend is the other way: Toward the contractor's dealing directly with the supplier.

Based on past performance, Government Furnished Equipment (GFE) should cut up nearly half of that \$7.7 billion. And Washington and industry planners are still debating the best way to spend about \$1.5 billion on equipment.

It is a vital debate for both industry and government. On the one hand, it solves one longstanding problem for the aircraft supplier. On the other, the government must face the fact that when a prime contractor negotiates for what once was GFE, the armed services' procurement regulations (written for the government) may or may not apply.

And there's the snarl of the "overall picture." No one in industry has access to all the facts necessary to see it. The government will still have to decide, for example, how many of a certain type of soldier jets will be needed by both Air Force and Navy, and double which has priority. So most military men—and you will find industry people agreeing—think the government should continue the GFE procedure, even in the new and specialized aviation field.

## Industry's View

What the industry thinks about this problem was rounded up by AVIATION WEEK in a series of interviews with both airplane manufacturers and suppliers of aviation equipment. Roughly speaking, the same split in opinion that is found in Washington was noticed in the conversations around the nation.

Here's the view of a large aircraft company: "The Government Furnished Equipment problem has been discussed for many years. But we think the airplane companies would just as soon let it stay the way it is. In only one case have we asked for equipment not available under existing government procurement.

"We think the trend will be confined to avionics, will not be hampered to cover things like engines."

Two other airplane manufacturers—both also deep in guided missiles, where avionics is perhaps the most important item—look at it this way:

First company: "There is a trend to swing away from GFE to company procurement in certain specialized areas in the avionics field. But the services still specify what they expect the equipment to do.

"One advantage of the direct program is that it will enable the plane builder to control the design of an item better so that it is better designed to fit the airplane."

"Another is that the prime contractor can frequently make a better deal—on price and delivery—than the government. This is probably one reason the AF is swinging away from GFE."

Second company: "Trend seems to be confined to avionics equipment and parts.

"We think it's a significant move on the part of the AF, though the plan might not work too well for equipment in the development stage. But when it does, it is standardized, GFE can become burdensome. This is especially true on parts. For example, the aircraft contractor might be furnished with the proper number of parts. But if one is lost or damaged he has to go through considerable paper work to get a replacement. If the company did the procuring it would allow for a few extras."

## What Suppliers Think

The companies that make the avionics equipment might be more directly affected by any shift in government procedures than would the airplane people. The suppliers, too, are far from unanimous in their views.

One avionics manufacturer says:

"To date, probably about 10 percent of avionics procurement has been handled directly by airplane builders rather than the government."

"If a contractor took responsibility for coordinating all parts of the airplane he or she would bear responsibility for the weapon's success or failure. It might speed time from drawing board conception of a plane to its use."

"Whether the airplane industry is ready to take on such a responsibility is not certain. In the first place, it would have to duplicate all the government activities now wrapped up in AF and Navy. And it would have to duplicate the technical experience of those people."

The personal manufacture of ground side equipment thinks the trend should be encouraged.

"One bottleneck in plane production schedules has been GFE which has been manufactured by companies doing other commercial work.

"People depending on these manufacturers would have a better economic club if they could deal with them direct instead of going through the government. Manufacturers have a lot of projects the government set on small items while they push some other commercial development. They have their own ideas about deadlines, feel there's no hurry. But they don't realize their little thimble is holding up production of an airplane."

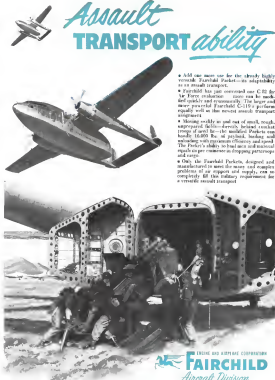
## The Middle View

Sitting in the center of the heavy West Coast avionics production where he can stare opinions of both prime contractors and suppliers, Capt. L. D. Wells, of the Aircraft Industries Ass'n's Los Angeles office, takes a middle view:

"Electronics is the main item being contracted by the aircraft builder. There's a close liaison if the government is out of the negotiations."

"There doesn't appear to be any rise in changing the procurement plan for major items, such as engines, tires, etc.

"On the other hand, there's a definite advantage to GFE when the equipment is standardized. The government can buy in quantity at reduced rates to supply several contractors."



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